Multifunctional Composite Structure

Completed Technology Project (2010 - 2013)

Project Introduction

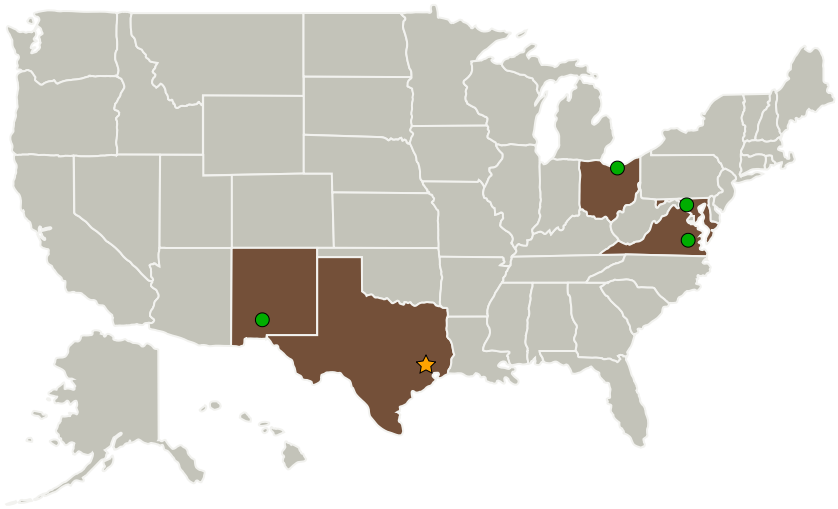
This project is developing a Composite Sandwich Habitable Pressurized Structure for deep space travel. Permeability, radiation, & micrometeoroids and orbital debris (MM/OD) shielding are built into the structure for a material system focused on deep space environments.

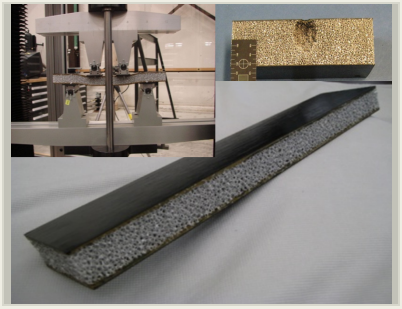
Hypervelocity testing of high and low density foam has been performed to bound the MM/OD shielding capability with our aluminum alloy. Additionally, mechanical testing at both densities has been performed to understand the synergism of a focused, system designed structure. Analytical models for structural and environmental response are being developed and correlated to test data. As a result, an intermediate sandwich core density has been selected for further testing. This resultant structure is being built into prototypes at component and full scale levels. The next phase includes maturing the mechanical testing of the selected metallic foam density (including physical modeling), manufacturing formed multifunctional composite structural components into a Generation 3A MMSEV, and maturing the mathematical model to address the structural effect of an impermeability bladder embedded into the core.

Anticipated Benefits

This project is important to NASA/JSC because of the critical need for multifunctional deep space pressurized habitable structure [lightweight, compact, robust, shielding (radiation, MM/OD, permeability)].

Primary U.S. Work Locations and Key Partners





Project Image Multifunctional Composite Structure

Table of Contents

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Center / Facility:

Johnson Space Center (JSC)

Responsible Program:

Center Innovation Fund: JSC CIF

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Organizations Performing Work	Role	Type	Location
Johnson Space Center(JSC)	Lead Organization	NASA Center	Houston, Texas
ERG Aerospace	Supporting Organization	Industry Veteran-Owned Small Business (VOSB)	
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland
Jacobs Engineering Group, Inc.	Supporting Organization	Industry	Dallas, Texas
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia
White Sands Test Facility(WSTF)	Supporting Organization	NASA Facility	Las Cruces, New Mexico

Primary U.S. Work Locations	
Maryland	New Mexico
Ohio	Texas
Virginia	

Project Management

Program Director:
Michael R Lapointe

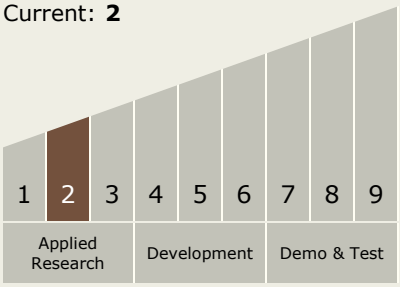
Program Manager:
Carlos H Westhelle

Project Manager:
David R Lowry

Principal Investigator:
David R Lowry

Technology Maturity (TRL)

Start: **2**
Current: **2**



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.2 Structures
    - TX12.2.5 Innovative, Multifunctional Concepts

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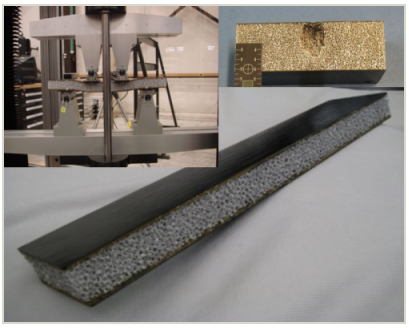
Images



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Project Image Multifunctional Composite Structure
(https://techport.nasa.gov/image/2141)